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2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/781,354	DICKEN, VOLKER
	Examiner	Art Unit
	Daniel F. Hajnik	2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3,5,7-9,13-15 and 18-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3,5,7-9,13-15 and 18-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the claimed "computer readable medium" in claims 8, 9, and 14.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 3, 5, 7-9, 13, 14, 18-20, 22-25, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gering (NPL Document "A System for Surgical Planning and Guidance using Image Fusion and Interventional MR") in view of Payne (NPL Doc, "Distance Field Manipulation of Surface Models") in further view of Pfister et al. (NPL Doc, "Cube-3: a real-time architecture for high-resolution volume visualization").

As per claim 8, Gering teaches the claimed:

8. A computer program readable medium having computer instructions for volume visualization for extracting meaningful information from 3D volumetric data *(towards top of page 20, "The surface models can then be visualized in the 3D view along with the reformatted slices, and the slices can selectively clip away potions of some models, such as the skin, to reveal other*

unclipped models beneath, such as a tumor"), the computer readable medium comprising computer instructions for:

obtaining 3D volume data from a source, the 3D volume data organized into a plurality of slices, each slice organized into a plurality of rows, each row comprising a plurality of voxels; *(page 45 in figure 2-13, where the source is "0.5 T MR Scanner" and top upper portion of page 32, "Medical imaging scanners typically output data in the form of 3D arrays of volume elements appropriately called voxels");*

performing image segmentation on the 3D volume data to identify a predetermined feature of the 3D volume data and to identify voxels that define a surface of the identified predetermined feature of the 3D volume data; *(page 41, figure 2-10, "The label map of a tumor is created by segmenting slices (top). Next, a polygonal surface is created to encompass the segmentation")*

volume rendering the 3D volume data to create a 2D image of the 3D volume data; *(on page 45, in figure 2-13, where the 3D view (which has second voxels) is shown on a LCD display monitor as shown, where the LCD display monitor displays the second voxels as a 2-dimensional image)*

providing a user interface to enable a user to interactively select the voxel distance; *(page 42, figure 2-11 and towards top of page 20, "The surface models can then be visualized in the 3D view along with the reformatted slices, and the slices can selectively clip away potions of some models, such as the skin, to reveal other unclipped models beneath, such as a tumor" where the distance is specified in terms of this selective clipping away from the model, i.e. distance from the outer skin)*

visualizing the output of the volume rendering as a 2D image *(see output screen on page 21, in figure 1-3, where the rendered second voxels are display on the monitor as a 2-dimensional image).*

Gering does not explicitly teach the remaining claim limitations.

Payne teaches the claimed:

using the defined surface as a reference surface, assigning to voxels outside the defined surface a value indicative of a voxel distance of each of the voxels from the defined surface; *(1st paragraph on first page, "To manipulate surfaces more effectively, we develop a method that uses distance fields—the scalar fields derived from triangle-based surface models" where the tri-based surface model serves as the reference surface and towards the lower portion of the 1st col on page 66, "A suitable field is the distance field, which represents the distance from a surface as a signed magnitude" where this surface is a reference surface because the distance is measured in terms of distance from this reference surface, and towards the lower portion of the 1st col on page 66, "Raya and Udupa used voxel models' distance fields to interpolate structures in two and three dimensions" where voxels are a distance from the reference surface as well)*

controlling said volume rendering to create a 2D image of the 3D volume data wherein the voxels in the 2D image are all equidistant from the reference surface and thereby constitute a surface parallel to the reference surface spaced therefrom by the selected voxel distance; *(top of 1st col on page 66, "2. Offsets: What is the surface a fixed distance above or below a given surface?" and middle of 1st col on page 68, "computing the surfaces a fixed distance into a model ... This method lets us compute surfaces of fixed thickness from arbitrarily convoluted surfaces")*

creating an output of the 2D image from the volume rendering that is indicative of the surface parallel to the reference surface and spaced therefrom by the selected voxel distance; *(top of 1st col on page 66, "Offsets: What is the surface a fixed distance above or below a given surface? ... The cortex of the brain, for example, is organized into layers (laminae) that might by accessible by offset surfaces" and Figure 2 and its caption, "We produced this surface (shown solid textured) as an offset the outer transparent surface" where figure 2 is an output of a 2D image).*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Gering with Payne. Gering can be modified by Payne by incorporating the offset surface removal process (middle of 1st col on page 68) into the medical interactive system shown in 1-3 on page 21 of Gering. In this instance, the user has the option to specify an offset from a given layer of the brain surface. To modify the reference of Gering, the distance field computation of Payne would have to be performed first, and then Gering can incorporate the offset surface removal process. Payne teaches one advantage of the combination (in the 1st paragraph on the 1st page, "But manipulating surfaces using either direct or implicit methods present a number of challenges. To manipulate surfaces more effectively, we developed a method that uses distance fields—the scalar fields derived from triangle-based surface models").

Pfister teaches the claimed:

for each slice, reformatting the 3D volume data comprising voxels that define the defined surface, such that the defined surface is moved to a common row of the slice;

and the claimed:

for each slice, reformatting the 3D volume data comprising the voxels that arc outside the defined surface, such that the respective voxel distances from the moved defined surface subsequent to reformatting remain the same as the respective voxel distances from the defined surface prior to reformatting:

by teaching of reformatting an array of voxels in figure 3. For example consider the following comparison:

Applicant's Invention

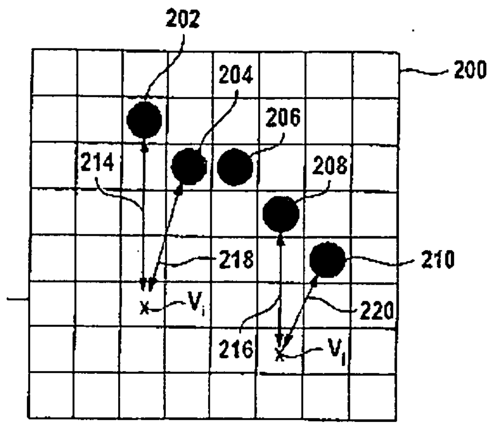

Fig. 2

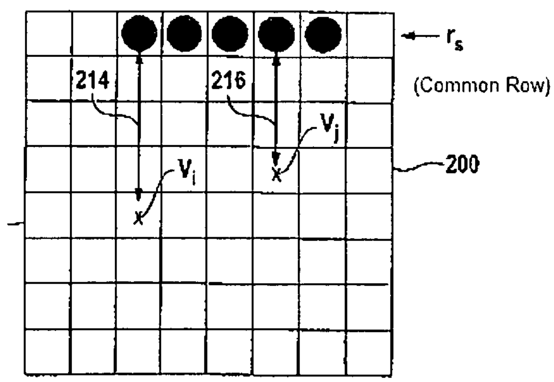

Fig. 3

Prior Art (Pfister)

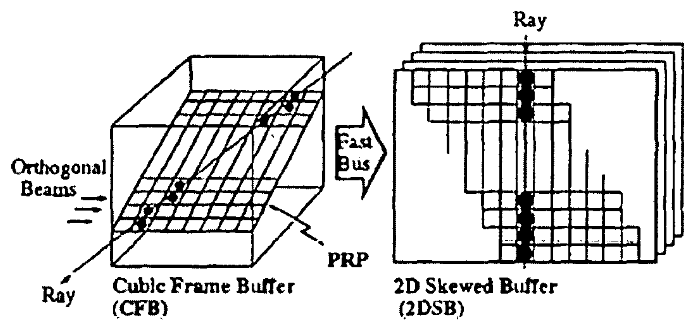

Figure 3: Arbitrary Viewing Mechanism.

As shown in figure 3 of Pfister, the image of left where the ray passes through is a common row. The image of the right shows these voxels reformatted in respect to the common row. In this instance, the distances to other voxels remain the same before and after reformatting in respect to the common row.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Gering, Payne, and Pfister. Gering and Payne are modified by incorporating the arbitrary viewing mechanism for volumes in figure 3 of Pfister into the voxel reformatting process of Gering in section 2.3.1 on page 32. This will allow the reformatting voxels of Gering to establish a common row as shown in figure 3 of Pfister. One advantage to the combination is to reorient the voxel data for a given perspective in order to make the voxel data easy to calculate and manipulate after re-orientation. This is achieved because the voxel data after reformatting is better organized in respect to a given viewpoint. Thus, it would be easier to pan the image data horizontally or vertically left or right when it is formatted as shown in figure 3 in the figure on the right.

As per claim 9, Gering does not explicitly teach the claimed limitations.

Payne teaches the claimed:

9. The computer readable medium of claim 8, comprising further computer instructions for of controlling said volume rendering via the user interface to create a series of 2D images of the 3D volume data wherein voxels in each 2D image are all equidistant from the reference surface, the voxel distances for the 2D images of the series are different so that a series of surfaces parallel to the reference surface are obtained, each spaced by a different voxel distance *(top of 1st col on page 66, "2. Offsets: What is the surface a fixed distance above or below a given surface?" and middle of 1st col on page 68, "computing the surfaces a fixed distance into a model ... This method lets us compute surfaces of fixed thickness from arbitrarily convoluted surfaces" where repeating this process with different fixed thicknesses can produce a plurality of such parallel*

surfaces because each surface is based upon a fixed distance from the original reference surface and thus each would be parallel to one another)

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Gering. Payne teaches the advantage of the combination *(top of 1st col on page 66, "Offsets: What is the surface a fixed distance above or below a given surface? ... The cortex of the brain, for example, is organized into layers (laminae) that might by accessible by offset surfaces" where examining the layers would be simpler using the technology of Payne).*

As per claim 14, Gering teaches the claimed:

14. The computer readable medium of claim 8, wherein the volumetric data is medical image data. *(page 21, in figure 1-3, where a medical image data is shown).*

As per claim 19, this claim is similar in scope to claim 8, and thus is rejected under the same rationale.

As per claim 3, Gering teaches the claimed limitations.

3. The method of claim 19, wherein the distance from the reference surface is determined along a direction of projection. *(page 62, caption in figure 3-2, "Trajectory planning is performed by positioning points for entry (yellow) and target (red), and examining the reformatted planes oriented relative to the connecting path" where the direction of projection is a trajectory, in this instance, a distance is defined between the entry and target locations).*

As per claim 5, Gering does not explicitly teach the claimed limitations.

Payne teaches the claimed:

5. The method of claim 19, wherein the distance measure is an Euclidean distance. *(middle of 1st col on page 67, "Euclidean distance calculation").*

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Gering. This is based on the fact that Euclidean distance can be used to measure distance between two points on a graphics model in 3D space. Such a measurement technique can be used in conjunction with the model shown in figure 1-3 of Gering where is represented in 3D space using voxels. The Euclidean distance is a well-used and effective means for measuring distance in multi-dimensional space such as a 3D space containing voxels.

As per claim 7, Gering teaches the claimed:

7. The method of claim 19, wherein the volumetric data is three dimensional microscopy data. *(page 76, section 4.3.3, "The key in this application is that the lesion is benign, small, and difficult to find ... The 3D Slicer can significantly reduce risk of damage by guiding the surgeon more directly toward small lesions" where the small lesions are microscopy data on the volumetric display).*

As per claim 18, Gering does not explicitly teach the claimed limitations.

Pfister teaches the claimed:

18. The method of claim 19, wherein the step of reformatting the 3D volume data comprising the voxels that are outside the defined surface moves all voxels outside the defined surface that are

equidistant to the defined surface into a common row of each slice *(in figure 3 where the image on the left shows that all voxels outside a given surface, i.e. the darkened line, move all these voxels to a common row as shown by the image on the right).*

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Gering. This is based on the fact that Gering also can reformat volume data as shown in figure 1-4. Pfister provides more specific features of reformatting such as moving all voxels outside the defined surface that are equidistant to the defined surface into a common row of each slice as shown in figure 3. These capabilities can enhance the reformatting of Gering in order to achieve better alignment for a given diagonal row of data by moving them together to a common row. The motivation to combine Pfister with Gering in claim 1 is incorporated herein.

As per claim 22, this claim is similar in scope to claim 9, and thus is rejected under the same rationale.

As per claim 20, the reasons and rationale for the rejection of claim 8 is incorporated herein.

Gering teaches the claimed:

subjecting a patient to a scanning technique to obtain a sequence of 2D slices of a preselected body portion containing one of an organ, an anatomic structure, or a pathologic feature of the patient; *(figure 2-13, the "0.5 T MR Scanner" and towards the bottom of page 32, "Volume data is stored as a stack of 2D images as displayed in Figure 2-3" which contains an organ)*

manipulating said sequence of 2D slices to obtain 3D volume data, the 3D volume data organized into a plurality of slices, each slice organized into a plurality of rows, each row comprising a plurality of voxels *(page 45 in figure 2-13, where the source is "0.5 T MR Scanner" and top upper portion of page 32, "Medical imaging scanners typically output data in the form of 3D arrays of volume elements appropriately called voxels)*;

performing image segmentation on the 3D volume data to identify one of an organ, an anatomic structure, or a pathologic feature of the patient and determining from the portion of the 3D volume data that constitutes the identified one of an organ, an anatomic structure, or a pathologic feature of the patient; *(pg. 36, caption of figure 2-5, "the outline of the tumor segmentation is drawn in green on an anatomical image on the left, and on a vascular image on the right. BOTTOM: The vascular image is fused with the anatomical image using uniform blending on the left, but selective overlay on the right").*

Gering does not explicitly teach the remaining claim limitations.

Payne teaches the claimed:

using the defined surface as a reference surface, assigning to voxels outside the defined surface a value indicative of a voxel distance of each voxel from the defined surface; *(towards the lower portion of the 1st col on page 66, "A suitable field is the distance field, which represents the distance from a surface as a signed magnitude" where this surface is a reference surface because the distance is measured in terms of distance from this reference surface, i.e. the outer brain surface, and towards the lower portion of the 1st col on page 66, "Raya and Udupa used*

voxel models' distance fields to interpolate structures in two and three dimensions" where voxels can form the reference surface as well).

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Gering. The rationale for combining these features is incorporated from both claims 1 and 18.

As per claim 13, Gering teaches the claimed:

13. The method of claim 20, wherein the body structure is an organ or other pathological structure. *(on page 33, in figure 2-3, where it shows the body structure as an organ).*

As per claim 23, this claim is similar in scope to claim 9, and thus is rejected under the same rationale.

As per claim 24, the reasons and rationale for the rejection of claim 8 is incorporated herein. The examiner will examine and interpret this claim under 35 USC 112, 6th paragraph. Gering teaches the means for obtaining volume data *(page 45, in figure 2-13, the scanner system"),* means for performing image segmentation *(page 45, in figure 2-13 where the Workstations and Console provide processing and memories capabilities),* and means for performing other volume data manipulation techniques *(page 45, in figure 2-13 where the Workstations and Console provide processing and memories capabilities).*

As per claim 27, this claim is similar in scope to claims 9 and 24, and thus is rejected under the same rationale.

As per claim 25, this claim is similar in scope to claims 20 and 24, and thus is rejected under the same rationale.

As per claim 28, this claim is similar in scope to claims 9 and 24, and thus is rejected under the same rationale.

3. Claims 15, 21, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gering (NPL Document "A System for Surgical Planning and Guidance using Image Fusion and Interventional MR") in view of Payne (NPL Doc, "Distance Field Manipulation of Surface Models") in further view of Pfister in further view of Gillick et al. (US Patent 5,530,455).

As per claim 21, the reasons and rationale for the rejection of claims 8 and 20 are incorporated herein.

Gering does not explicitly teach the claimed limitations relating to the mouse wheel.

Gillick teaches the claimed:

to enable a user to interactively select a voxel distance to the reference surface by means of a wheel mouse, the rotation of the wheel of the wheel mouse being correlated with the user's selection of a voxel distance; *(col 2, lines 29-33, "to operate under the control of a mouse with a roller which implements scrolling. The turning of the roller, in conjunction with driver software, generates scroll signals to Windows which mimics the action of the user clicking in the scroll controls" where this scrolling control is applied to the distance selecting of Gering)*

It would have been obvious to one of ordinary skill in the art to combine Gering, Payne, Pfister, and Gillick in order to improve performance in programs by adding a mouse wheel capability for scrolling functions (col 2, lines 21-24), for example, improved capabilities to scroll to navigation a user interface.

As per claim 15, this claim is similar in scope to claim 13, and thus is rejected under the same rationale.

As per claim 26, the reasons and rationale for the rejection of claim 9 is incorporated herein. The examiner will examine and interpret this claim under 35 USC 112, 6th paragraph. Gering teaches the means for obtaining volume data *(page 45, in figure 2-13, the scanner system")*, means for performing image segmentation *(page 45, in figure 2-13 where the Workstations and Console provide processing and memories capabilities)*, and means for performing other volume data manipulation techniques *(page 45, in figure 2-13 where the Workstations and Console provide processing and memories capabilities)*.

Response to Arguments

1. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F. Hajnik whose telephone number is (571) 272-7642. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka J. Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

D. H.

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